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Spruce Budworm Control Economics

How does the land manager or small forest landowner decide when it is economically justified to protect a stand from further defoliation by the spruce budworm — or when the damage is already too severe and the value of the trees to be saved insufficient to justify the cost of the aerial sprays? An approach to the solution of this vexing problem has been devised by one CANUSA cooperator, in the form of a decision model adapted for use on a TI-59 hand-held, programmable calculator.

The TI-59 program was developed to help forest managers and pest control specialists identify those parts of an ownership where control benefits outweigh control costs. Use of this program would be appropriate on public lands or private forest lands where the objective is timber production, when defoliation has occurred, when an approved control method does exist and is feasible, and when harvest is not possible for at least 2 to 5 years.

Using such variables as stand species composition, anticipated years to harvest, expected stumpage price at that time, and the amount of spruce-fir volume at harvest with, or without, protection, the program estimates the discounted value of treatment costs and wood volume saved, and the net present value of insect control. The rate of return for control activities and the break-even percentage are calculated.

A user's manual for this hand-calculator program has been prepared, complete with examples of stand and economic data inputs and an illustration of the resulting decision analysis. This manual will be published in modified form, as part of an information package relating to rapid economic evaluation of spruce budworm population/forest management options. The manual, tentatively entitled "The Cost of Doing Nothing," is scheduled for publication in the fall of 1983. The authors are Bob Marty and Bob Manthy, of Greentree Consultants, Lansing, Michigan.

Inquiries about the availability of the calculator program should be directed to CANUSA-East Program Management, USDA Forest Service, 370 Reed Road, Broomall, PA 19008 (telephone 215-461-3017).

Dave Grimble — Applications Coordinator
CANUSA-East
Broomall, Pennsylvania

CANUSANs at the Entomological Society Meeting

The eastern branch meeting of the Entomological Society of America, in Hartford, Connecticut, was the setting for a CANUSA-East symposium on spruce budworm feeding behavior and foliage quality.

A small but interested and enthusiastic group listened to Paul Albert discuss the physical and chemical basis of host-plant selection by the spruce budworm. Mike Montgomery presented his work on nitrogen consump-

tion and utilization by spruce budworm during larval development. Bill Mattson updated the audience on his work on the influence of foliar nutrients on performance of spruce budworm larvae, and Mike Schmitt summarized work on inorganic foliage nutrient levels and spruce budworm fecundity.

The questions and answers following each presentation provided additional clarification for these complex subjects. But many questions still need to be answered before we fully understand the role of foliage quality in the population dynamics of the spruce budworm.

Dave Grimble — Applications Coordinator
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Spray Efficacy Workshop

Surely it is easier for a camel to pass through the eye of a needle than for 23 researchers representing 9 scientific disciplines to tackle a common problem. Well, those camels had better start dieting — the Spray Efficacy Workshop held in Toronto November 1-3, 1982, saw meteorologists talking to entomologists, agricultural engineers arguing with toxicologists and, unlikely as it may seem, agreeing on a number of hitherto highly controversial issues.

The workshop was sponsored by the New Brunswick Spray Efficacy Research Group (NBSESG) as part of its continuing effort to promote a detailed, predictive definition of the chemical, physical, and biological mechanisms that make or break the efficacy of an aerial spray. Fourteen papers were presented in informal, open sessions, which permitted extensive discussion and valuable input from all participants.

Among the many relevant topics addressed by participants from Canada, the United States, and Great Britain, the influence of larval behavior on vulnerability, the importance of atmospheric turbulence to droplet deposition, and the need for defining the density and size of droplets delivered to the larval microhabitat emerged as unifying factors in the spray efficacy process.

Although further experiments are required to define quantitatively the influence of meteorological conditions and canopy density on foliar droplet deposit, the conclusion is now unequivocal; spraying under moderately turbulent conditions results in *higher levels of foliar deposit, less variability in deposit, and reduced downwind drift*. These results of several years work by the NBSESG were further supported by identical conclusions arising from extensive agricultural research at the International Centre for the Application of Pesticides in Cranfield, England.

Another highlight of the meeting was the revelation that researchers at the Forest Pest Management Institute, Sault Ste. Marie, Ontario, are accumulating evidence relating to droplet size, density, and concentration

on needles that appears to provide the first mechanistic explanation for the long-standing unpredictability of *Bacillus thuringiensis*. If this work is successful (and the evidence is very compelling), a judicious combination of concentration, droplet size, and application conditions could spell the end of the uncertainty that has plagued the field efficacy of this material for so long.

The workshop concluded in an atmosphere of exhausted enthusiasm and the general conviction that significant progress had been made.

Charles J. Wisener — Coordinator
New Brunswick Spray Efficacy
Research Group
Research and Productivity
Council
Fredericton, New Brunswick

Armilaria Root Rot in Spruce-Budworm-Damaged Balsam Fir Stands

Armilaria root rot, caused by *Armilaria mellea* (Vahl ex Fr.) Kummer, is one of the most important root and butt rot problems of Canadian forests. In Newfoundland it is the most important disease of living trees — a primary killer in young softwood plantations and a secondary killer in natural softwood stands predisposed by unfavorable site or stand conditions, or those damaged by insects.

Earlier studies in Newfoundland have shown that damage by insects, such as balsam woolly aphid (*Adelges piceae* [Ratz.]) and Hylobius weevils (*Hylobius warreni* Wood and *H. pinicola* Couper), increase the intensity of the root rot, and the disease subsequently increases the mortality of trees and decadence of stands damaged by insects.

In 1981, investigations were begun to determine the distribution and severity of root rot in balsam fir stands damaged by the spruce budworm. One hundred and twenty-eight balsam fir trees in four budworm-damage classes (light, moderate, severe, and dead) were selected from eight stands equally divided between central and western Newfoundland. Thirty-two trees (average age, 33 to 51 years; height, 6 to 12 m (20 to 40 ft); and d.b.h., 5.9 to 12.1 cm [$2\frac{5}{16}$ to $4\frac{3}{4}$ in]) were examined in each damage class. No control plots were established because no undamaged stands of balsam fir could be found. Sample trees were cut 1 m (3 ft) above ground and their root system exposed by hydraulic sprays (fig. 1). A total of 557 primary and 3,122 secondary roots of the trees were examined for *A. mellea* infection.

Preliminary results have shown that the incidence of root rot, indicated by the average percentage of trees infected, increased from 47 to 91 percent with the increasing severity of budworm damage from light to the dead damage class. A similar increase in the intensity of the disease was shown by the increased percentage of roots infected per tree (18 to 86 percent of the primary roots and 10 to 40 percent of the secondary roots), and by the average maximum development of the fungus



Figure 1. Hydraulically exposed root systems. White mycelium of *A. mellea* seen on the wood of two roots after the removal of bark

mycelium under the bark of the infected primary roots (390 to 794 cm² [60.5 to 123 in²]).

Although the results are preliminary, they indicate that *A. mellea* is well established in spruce-budworm-damaged stands and may be important in the further deterioration of the affected stands. The fungus may also influence the recovery of many of the budworm-damaged trees. Further investigations to determine the influence of various stand and site conditions on the severity of the root rot and on the rate of deterioration of the damaged stands are in progress.

Pritam Singh and — Newfoundland Forest
A.G. Raske Research Centre
Canadian Forestry Service
St. John's, Newfoundland

CANUSA-East Schedules Two Meetings

Program Management in Broomall has announced two open meetings for later this year. Dan Schmitt expects at least 200 attendees for the August 17-19 symposium on utilization of budworm-killed spruce and balsam fir. The meeting, cosponsored by the University of Maine at Orono, State of Maine, the Pulp and Paper Foundation, and CANUSA, will be held in Orono. Proceedings will be published by the university.

Spruce budworm population monitoring and evaluation is the subject of another gathering, scheduled for September 13-15 at Burlington, Vermont. The Northeastern Forest Experiment Station will publish the proceedings.

For more details, contact Dave Grimble at CANUSA-East, (215) 461-3017 (FTS 489-3017).

CANUSA Spruce Budworms Program Symposium Planned

Mark your calendar! The grand scientific wrap-up of the Program will take the form of a symposium in Bangor, Maine, September 18-21, 1984. Plan to attend. Prepare for the poster sessions. See you there.

1982 Program Management Meeting

Keltic Lodge on the Cabot Trail, Cape Breton Highlands, Nova Scotia, provided the venue for the October 26-28, 1982, meeting of the Program Management team. With the exception of Doug Miller (PFRC), Bob Taylor (CFS-HQ), and Terry Ennis (FPMI), all the management staff were present and accounted for. Special guests Ed Robie and Carl Berntsen from the Society of American Foresters joined the group, and Harald Piene (MFRC) observed some of the sessions and led the field trip.

Considerable attention was focused on planning the Program's major scientific event, the budworms symposium. At last year's management meeting a steering committee consisting of the Program Leaders (Cochairmen), Graham Page, Ron Stark, Bob Talerico, and Doug Miller was assembled to start organizing the symposium. Ron and Graham were charged with coordinating dates and recommending suitable sites. Data were then presented to the management group, and with the help of Ed Robie and Carl Berntsen, it was agreed that the most appropriate dates were September 18-21, 1984, and the best choice of locations was Bangor, Maine. Two program Cochairmen, Ron Stark and Chris Sanders, were identified to ride herd on the symposium program. Local arrangements are the responsibility of



Figure 2. From left, Dan Schmitt, Ron Stark, Harald Piene, and Ben Moody examine budworm-killed trees on Cape Breton Island.

Graham Page and Bob Talerico. Chairmen for the poster sessions are Russ Mitchell and Bob Taylor. The proceedings will be published as a contribution to the biological literature, with Janet Lalonde (CFS) and Janet Searcy (Janet squared, would you agree!) to act as coeditors. The proceedings will be published in Canada. Abstracts of poster sessions as well as feature articles will be subjected to peer review prior to publication.

Janet Searcy led the discussion on producing a CANUSA information device suitable for use on generally available videotape equipment. The videotape will focus on Program accomplishments and will be a companion to the printed Program Accomplishments Report. Managers from the several CANUSA com-

ponents are cooperating with Janet to provide suggestions for suitable material.

One-half day was devoted to technology transfer plans. Technology transfer is important — the whole research effort loses its impact if suitable end-point transfers are not designed to put the results of new science into the hands of those concerned with managing the forests.

A highlight of the meeting was a tour of the Cape Breton Highlands, site of the recent devastating attack of the budworm. The tour was arranged jointly by personnel from the Nova Scotia Forest Service and Harald Piene of MFRC. It provided an opportunity for several delegates to see for the first time the tremendous carnage of the forest as a result of an unprecedented budworm outbreak. Dead trees in all directions as far as the eye can see are the results of the infestation, and the efforts to salvage are evident in the "largest clearcut in history." Following the field trip, MFRC hosted the group at an informal dinner at the Lodge.

Eastern Spruce Budworm Council Fall Meeting

The fall meeting of the Eastern Spruce Budworm Council was held at the Chateau Frontenac, Quebec, on Tuesday, November 9, 1982. Representatives, mostly deputy ministers of the forest resources sector, from Newfoundland, Nova Scotia, New Brunswick, Quebec, and Ontario, and representatives from Maine, USDA Forest Service, and the CFS provided summaries of the 1982 outbreak and operations in their various jurisdictions and forecasts of conditions and plans for 1983. It was reported that the infestation persisted in most areas, and no relief is in sight for 1983.

Technology Transfer in Toronto

The joint meeting of the Entomological Society of Canada and the Entomological Society of America, held in Toronto the first week of December, 1982, hosted a major budworm symposium (17 papers). In addition, 23 other presentations were given on budworm-related topics outside the formal symposium. The *Newsletter* is pleased to print the impressive list of contributors, and we expect to feature at least some abstracts of these presentations in the March 1983 issue.

Harold Batzer, Yvan Hardy, and Bart Blum moderated the symposium, on habitat manipulation and outbreak characteristics of the spruce budworm. Bob Talerico presented an introductory summary of the status of CANUSA research on this topic, and turned the microphone over to

Lloyd Sippell — A Newly Recognized Characteristic of Spruce Budworm Eruptions

J.L. Stanis and Bill Miller — Effect of Minor Temperature Shifts and Density of Quality Factors of the Eastern (sic) Spruce Budworm

Wladimir Smirnoff — The Possible Cause for the Permanence of Spruce Budworm Outbreaks

Bill Mattson — Spruce Budworm Performance in Relationship to Foliar Macromicronutrition

S. Slocum — Essential Oils in the Diets of the Spruce Budworm

C.N. Koller — Response of Spruce Budworm to Condensed Tannins of Balsam Fir

Yvan Hardy — Performance of Spruce Budworm on White and Red Spruce and on Balsam Fir

Bart Blum — Preliminary Results in the Phenology of Bud Flushing Among White Spruce Provenances

M. Reeves — The Role of Carabid Beetle Predation of Spruce Budworm in Relation to Habitat

Hewlette Crawford — Wildlife and Spruce Budworm Relations

Don Burnell and Bill Kemp — Climatic Regions, Habitat Management, and Western Spruce Budworm Outbreaks

R.A. Flemming, Christine Shoemaker, and J.R. Stedinger — Statistical Analysis of Spruce Budworm Dynamics in Sprayed and Unsprayed Regions in Maine

Bob Frank — Have Twenty-Five Years of Selection Management Reduced Initial Spruce Budworm Losses?

Harold Batzer and M. Popp — Forest Succession Following a Spruce Budworm Outbreak in Minnesota

Bob Blais — Trends in the Frequency of Occurrence: The Extent and Severity of Spruce Budworm Outbreaks in Eastern Canada

Dave Fellin and Clint Carlson — The Western Spruce Budworm in Managed Stands in the Northern Rockies

Other budworm presentations, scattered throughout the week of meetings, included

Mark Houseweart, Dan Jennings, S.H. Pease, and R.K. Lawrence — Alternate Hosts of *Trichogramma minutum* Riley, an Egg Parasitoid of *Choristoneura fumiferana* (Clemens).

L.C. Ellis-White and Bill Seabrook — The Effect of Temperature on Mating Success of the Spruce Budworm, *Choristoneura fumiferana*

Bud Irving — My Fir Lady: The New Brunswick Production with its Facts and Fancies

Gordon Baskerville — Pest Control in Resource Management or Why Do We Cause All This Trouble?

Jean-Marie Binot and Yvan Hardy — A Relation Between Microclimate and Larval Development of Spruce Budworm

G.T. Harvey — Genetic Variation in *Choristoneura fumiferana*

A.A. Mohamed, L. Lewis, and D. Lewis — Susceptibility of the Spruce Budworm, *Choristoneura fumiferana*, to Two Isolates of *Metarhizium anisopliae*

E.J. Dobesberger and K.P. Lim — Optimum Sample Size for Early Instar Larvae of *Choristoneura fumiferana* (Clemens) in Newfoundland

John Witter and Ann Lynch — Impact of the Spruce Budworm in Michigan's Upper Peninsula, 1978-1982

Ann Lynch and John Witter — A Spruce Budworm Hazard-Rating System for Spruce Stands in Michigan's Upper Peninsula

J.L. Flexner and John Witter — Silvicultural Guidelines for Spruce-Fir Stands in the Lake States

Bruce Montgomery, Gary Simmons, R.G. Rogan, and John Witter — Spruce Budworm Technology Transfer Program in the Lake States

R.C. Reardon and D. Johnson — Efficacy of *Bacillus thuringiensis*, 3 Dose and 2 Volume Combinations, Against Spruce Budworm in Michigan

S.M. Smith, M. Hubbes, and J.R. Carrow — Effect of Rearing Temperature on *Trichogramma minutum* (Riley), a Parasite of the Spruce Budworm

Jan Volney, Bill Waters, K.Q. Lindahl, Jr., and A.M. Liebhold — Spatial Characteristics of Variation in Parasitism of Sparse and Dense Western Spruce Budworm Populations

E.A. Blake and Mike Wagner — Factors Influencing Consumption Rates of *Choristoneura occidentalis* in Northern Arizona

René Alfaro, Allen Van Sickle, and A.J. Thomson — Impact of the Western Spruce Budworm in British Columbia

Bob Blais — The Spruce Budworm Problem and Its Control Measures

Molly Stock — Current Genetic Approaches to Systematic Problems in Forest Entomology

Jackie Robertson and Molly Stock — Probability Model of Insecticide Efficacy for Forest Defoliators

Bill Seabrook — Sex Pheromone Induced Mating Suppression in the Spruce Budworm

S. Thirumurthi — Studies on the Behavior of Spruce Budworm Moths in Relation to Mating Suppression

A.M. Liebhold and Jan Volney — Effect of Foliage Proximity on the Attraction of Male Western Spruce Budworm to Attractant Sources

Our thanks to the CANUSA-West staff in Portland for extracting the names of these non-symposium speakers and their presentations from the official program for the Toronto meeting. The staff had to use the hunt-and-peck method, as the topics were scattered throughout several days of speeches.

Pest Management Considerations in Forest Planning

Planning for management of a National Forest, Region, or other large forested area requires processing large volumes of information. The USDA Forest Service has been using the FORPLAN computer program to find optimal harvest schedules. FORPLAN uses a linear programming algorithm and is time consuming and expensive. CANUSA-West investigators, in cooperation with planning personnel of the Siuslaw National Forest, have devised an efficient approach to solving large-scale problems in forest land-use planning. Their solution takes advantage of both the duality of linear program

formulations and the characteristics of problem decomposition inherent in the forest land-class relationship. Following decomposition, subproblems can be solved in a simple recursive fashion. This technique reduces the computational time and computer storage requirements for data processing. Forest management alternatives can be more easily and quickly evaluated and multiple-use considerations can be incorporated directly into the optimization as nonharvest values. Market and shadow prices from FORPLAN output are used to price pest suppression or other management strategies directly without rerunning FORPLAN.

This research is published as Working Paper No. 172 in the Giannini Foundation of Agricultural Economics, California Agricultural Experiment Station, and will appear in *Forest Science*. The procedures are currently being implemented at the University of California. National Forests and other planning units in the Forest Service will be provided with the techniques and instructions for their use.

Out and About

CANUSA-East announces publication of Supplement 2 of the *Spruce Budworms Bibliography*, containing 616 new citations. The new volume is laid out like Supplement 1; however, for the first time the Program was able to utilize the special computer typesetting capabilities of the Oak Ridge National Laboratory to produce camera-ready copy with Times Roman typeface instead of typewriter type. The net effect of this new technology is a significant reduction in pages (139 to 75) and therefore in printing cost. (Nonpublishers in the audience will be interested to learn that paper costs are responsible for over half the expense of printing!) Another benefit of computer-generated typesetting is reduced proofreading: once the input has been proofed carefully, it is not necessary to proofread at the "galley" stage. The material is not rekeyboarded by a typesetter, so new errors cannot be introduced into the text.

Supplement 2 is listed as Maine Agricultural Experiment Station Miscellaneous Report Number 268. You may request a free copy from Dr. Fred Knight, Director, College of Forest Resources, University of Maine, Orono, ME 04469. Investigators and libraries already on our bibliography mailing list should have received a copy around the first of November, 1982, but if yours did not arrive, don't hesitate to write Fred.

Dan Jennings, senior author on the bibliography project, tells us that copies of Supplement 1 are still available from the College of Forest Resources at the address above.

Relationships of Birds and Spruce Budworm — Literature Review and Annotated Bibliography was published in October 1982, in the USDA Bibliographies and Literature of Agriculture series (number 23). This book, by Hewlette Crawford and Dan Jennings, discusses bird predation on budworm populations and basic methods to determine budworm consumption rates. Brief sections describe the life histories of

important predaceous birds and predator-prey models. The bibliography summarizes each citation in a few sentences and relates its contents to the topics covered in the preliminary textual material just described.

Copies of this publication, referred to in-house as "birds 'n budworms," can be ordered from the Northeastern Forest Experiment Station, 370 Reed Road, Broomall, PA 19008.

Items from the Press

Research examines natural controls of budworm. — Predators that naturally control western budworm populations cannot be artificially induced to control the needle-eating insect during outbreaks.

This conclusion and several others resulted from a study examining the budworm's natural predators, which are insect-eating birds, parasites and insect-eating ants.

One of the study leaders, Torolf "Torgie" Torgersen, entomologist with the U.S. Forest Service research lab in LaGrande, announced preliminary results of the study this week.

Torgersen said it is not feasible or practical to increase ant, parasite, and bird populations to the point where they might control a budworm outbreak, simply because of the size and density of the Blue Mountains.

"They've done that over in Europe in intensively managed forests," Torgersen said, "but the western forests are simply too big."

Artificial control, usually with insecticides, is "necessary on a sporadic basis," he said.

About 140,000 forested acres in Eastern Oregon will be chemically controlled this summer (1982) to ward off high budworm populations that appeared in 1981. Because of the cost of applying the insecticide Sevin-4 Oil, no acreage will be sprayed in Union County this summer.

Trees will be sprayed to avoid defoliation on fir. Past budworm outbreaks have defoliated trees and caused growth loss for about 10 years.

Torgersen and his partner, Robert Campbell, who also is an entomologist, have found that natural predators do control budworm populations at suboutbreak levels.

Torgersen said the next step is to determine what types of forest management can be employed to maintain predator populations.

Torgersen took the scientists into the field Tuesday to show a few samples of his work.

The objective last summer (1981) was to determine which predators had the greatest effect on budworm populations in the Blue Mountains.

By fencing off fir tree branches, birds were excluded from feeding on budworm. By placing a gummy substance at the base of the tree, ants were excluded.

Torgersen said the result showed birds had the most impact on budworm populations. Ants had less impact and parasites had very little impact at all.

"But in some places parasites control the budworm on their own," Torgersen said. "It varies according to region."

To compensate for this, the study team is setting up a predator control study in New Mexico at a much higher elevation. Plots have already been set up in Western Montana and North-central Washington.

In addition to natural predators, Torgersen emphasized that the other conditions seem to control budworm populations as well. "Weather and all of these factors are so interconnected it's hard to separate them," he said.

The study, now in its fourth year, should be completed following the summer of 1983, but an extension may be issued.

Aside from the study, scientists' opinions differed on what causes an outbreak. "We need more information," was the message.

(The Observer — June 10, 1982)
LaGrande, Oregon

N.S. budworm problem expected to get worse. — Nova Scotia can expect increased populations of spruce budworm in western and northern mainland counties and parts of the Cape Breton Highlands next summer, forestry experts told the provincial government Monday.

"This has not been a good day for forestry in Nova Scotia," George Henley, lands and forests minister, said at a news conference where the information was made public.

However, he vowed no change "while I am minister" in a policy decision taken in the mid-1970s by a previous government that vetoed the use of chemical sprays to combat the pest.

A parade of experts from provincial and federal agencies reviewed the course of a budworm assault that has devastated the spruce and fir stands of the Cape Breton Highlands since the early 1970s.

"The spruce and fir forest of Cape Breton Island has been largely destroyed," said B.A. Pendrel, of the Canadian Forestry Service.

Henley said he would not label the provincial program of spraying forests with a bacterial agent, as opposed to chemicals, a failure. This was because the intention was to protect trees as best possible and "it would be an insult to our intelligence to suggest we could eliminate the budworm."

Other experts told reporters that as long as there are two budworms left, there could be 300 the following year, and that the upsurge in surviving budworms this year appeared to be due to circumstances as unpredictable as weather and an abundance of "flowers," or seed pods, on the softwoods this year. These provided the budworm with a rare source of high protein food.

Henley, in an interview, declined to label as a failure the decision not to spray with chemicals, made by a Liberal government before the Progressive Conservatives came to office in 1978.

The no-spray decision, he recalled, was directly linked to the controversy over suggested human health hazards from the spray, an emotional setting for decision-making that he declined to second-guess.

(The Citizen — October 26, 1982)
Ottawa, Ontario

Supports spray program. — Sir: I write in support of Marven Sellick's letter published in The Daily Gleaner, Aug. 26, 1982, supporting the spruce budworm spray program.

As a private woodlot owner, I am in full support of the spruce budworm spray program. I think the spray program should not only be continued but should be expanded to again include all private woodlots throughout the province where the spruce budworm infestation is heavy.

I suggest an end to the one-mile buffer zone so as to allow the resumption of budworm spraying on all private woodlots where budworm infestation is heavy. Woodlots which are not only dead and dying but serve as a breeding ground to reinfest forest areas which have been sprayed. It is my opinion that the establishment of the one-mile buffer zone from residential habitation was a disastrous decision for private woodlot owners.

The spruce budworm spray program should be continued until a proven effective alternative to the spray program can be put to full use throughout the province. Various anti-spray groups fought for and accepted the responsibility for the establishment of the one-mile buffer zone, without the voice of the majority of private woodlot owners; a buffer zone which resulted in the destruction of many woodlots. As a result of this, I would suggest the various anti-spray groups get together and establish a fund to compensate private woodlot owners for their tremendous loss of wood. Darrel R. Norrad, Boiestown.

(Daily Gleaner — September 4, 1982)
Fredericton, New Brunswick

Recent Publications

From the Northeastern Forest Experiment Station, 370 Reed Road, Broomall, PA 19008, you may request

Crawford, H.S., Jr., and D.T. Jennings. 1982. "Relationships of birds and spruce budworms — literature review and annotated bibliography." USDA Forest Service, Bibliog. Lit. Agric. 23, 38 p.

Walton, G.S., and F.B. Lewis. 1982. "Spruce budworm core B.t. test — 1980: combined summary." USDA Forest Service, Res. Paper NE-506, 12 p.

Dr. Fred Knight, Director, College of Forest Resources, University of Maine, Orono, ME 04473, announces the availability of another supplement to the ongoing bibliography project:

Jennings, D.T., S.C. Hacker, F.B. Knight, and M.E. McKnight, 1982. "Spruce budworms bibliography — Supplement 2." Misc. Rep. 268, Maine Agric. Exp. Stn., Univ. Maine, Orono. 75 p.

Bill Mattson will provide reprints of the next two articles. Write to him at the USDA Forest Service, Stephen S. Nisbet Building, 1407 S. Harrison Road, East Lansing, MI 48824.

Mattson, W.J., C.N. Koller, and S.S. Slocum. 1982. "Adult female spruce budworm, *Choristoneura fumiferana* (Lepidoptera: Tortricidae), dry weight in relationship to pupal fresh weight and case diameter." *Great Lakes Entomol.* 15(3): 185-187.

Mattson, W.J., N. Lorimer, and R.A. Leary. 1982. "Role of plant variability (trait vector dynamics and diversity) in plant/herbivore interactions." *In*: Proc. Third Internat. Workshop on Genetics of Host-Parasite Interactions in Forestry, Wageningen, The Netherlands, 14-21 September 1980. p. 295-303.

Gary Simmons has offered to supply copies of these two recent reports. Write to him at the Department of Entomology, Michigan State University, East Lansing, MI 48824.

Nyrop, J.P., G.A. Simmons, and D.G. Mosher. "The economics of presalvage alternatives as a method of minimizing spruce budworm losses." *Tech. Rep. 82-9*, Mich. Coop. For. Pest Manage. Prog., Mich. St. Univ., East Lansing. 57 p.

Nyrop, J.P., and G.A. Simmons. 1982. "Measurement and analysis of the activity of adult spruce budworm parasitoids." *Tech. Rep. 82-12*, Mich. Coop. For. Pest Manage. Prog., Mich. St. Univ., East Lansing. 78 p.

Forest Pest Management, USDA Forest Service, 2810 Chiles Road, Davis, CA 95616, can send copies of "An assessment of aerial application technology." *Rep. FPM 82-3*. June 1982.

CANUSA cooperator Chet Himel addressed the American Society of Agricultural Engineers at their 1982 summer meeting (June 27-30, Madison, Wisconsin). His paper (number 82-1001), "Analytical Systems for Pesticide Spray Transport and Impingement," is available from the Society, P.O. Box 410, St. Joseph, MI 49085.

Forest Service computer specialists in Atlanta have located what they believe is a first-ever marketing effort: a leaflet that describes six forestry-related programs usable with the most widely sold microcomputers. Two additional programs designed for one specific brand of microcomputer are also described. Free copies of the leaflet are available from Forestry Suppliers, Inc., P.O. Box 8397, Jackson, MS 39204. This information is offered as a development of interest to professional foresters, and is not an endorsement or warranty of any commercial computer program, product, or company.

A new, 77-page handbook covers in detail all current information on various changes in US federal tax law relating to timber ownership. The first section discusses timber expenditures and covers topics such as operating expenses, carrying charges, depreciation, and amortization and investment credit. The second section focuses on receipts from the sale of timber and forest products, and cost-share payments. The third section deals with timber losses from fire, windstorm, and other casualties.

This section explains how to determine the amount of deductible loss from casualties, thefts, and condemnations. The final section discusses the self-employment social security tax, Christmas tree production, and the minimum tax. An appendix is also provided in the handbook which includes a copy of Form T, the text of the timber-related provisions of the Internal Revenue Code and Regulations, and selected revenue rulings of the Internal Revenue Service. A copy of *Agriculture Handbook No. 596, A Guide to Federal Income Tax for Timber Owners*, can be obtained for \$4.75 from the Superintendent of Documents, Government Printing Office Bookstore, 275 Peachtree St., NE, Room 100, Atlanta, GA 30303.

A new catalog lists nearly 90 titles of slide-tapes and films on a wide variety of forestry topics. Intended audiences for these educational materials range from professional foresters to small woodland owners and students, depending on the topic. The slide-tapes and films may be rented or purchased. For a copy of the catalog, contact Edward C. Jensen, Coordinator, Forestry Media Center, School of Forestry, Oregon State University, Corvallis, OR 97331.

The "Report of the New Brunswick Task Force on the Environment and Reye's Syndrome," chaired by Walter O. Spitzer, has now been published. It may be found in *Clinical and Investigative Medicine*, Vol. 5, No. 2/3, p. 203-214, 1982.

The Environmental Impact Team at the Forest Pest Management Institute, Box 490, Sault Ste. Marie, Ont. P6A 5M7 have tabled the following File Reports for limited distribution:

B.B. McLeod. "Terrestrial impact studies on experimental aqueous formulations of spruce budworm, *Choristoneura fumiferana* Clem., control agents containing Triton® X-100, New Brunswick, 1982." No. 37. October 1982.

S.B. Holmes. "Aquatic impact studies on experimental aqueous formulations of spruce budworm control agents containing Triton® X-100, New Brunswick, 1982." No. 38. November 1982.

R.L. Millikin. "Song bird studies in New Brunswick forests treated with semi-operational applications of Matacil® flowable formulations in 1982." No. 39. September 1982.

D.P. Kreutzweiser. "Aquatic impact studies in New Brunswick forests treated with semi-operational applications of Matacil® flowable formulations in 1982." No. 40. November 1982.

B.B. McLeod, and P.D. Kingsbury. "Terrestrial impact studies of Matacil® flowable formulated in vegetable oil, Quebec, 1982." No. 41. November 1982.

S.B. Holmes. "Lethal toxicity of experimental aqueous formulations of spruce budworm control agents containing Triton® X-100 to rainbow trout." No. 42. November 1982.

In the Hopper

Publications Update

When this issue went to press (November 15, 1982), the Washington Office had received these manuscripts for processing:

Grimble, D.G., Morris, O.N. "Regional evaluation of B.t for spruce budworm control in Maine and Canada." (Agric. Handb.)

Adamus, Paul. "Techniques for monitoring environmental impacts of insecticides." (Tech. Bull.)

Montgomery, Bruce A., Dimond, John B., Witter, John A., Simmons, Gary A. "Insecticides for control of the spruce budworm." (Tech. Bull.)

These three handbooks will appear in USDA series, probably by late summer of 1983.

Chapters for the eastern management manual — *A User's Guide for Managing Spruce Budworm in Eastern North America* — have been coming in for editing during the past 4 months. In hand at presstime are Dan Schmitt's preface, Bob Talerico's chapter on spruce budworm biology, and Lloyd Irland and Ken Runyon's chapter on the economics of budworm management strategies. Over the next few months, we will be receiving chapters from Allen and Dorais (detection), Witter and Ostaff (damage assessment), Blum and Maclean (prevention), Dimond and Morris (microbial control), Shea and Nigam (chemical control), Trial and Kingsbury (environmental impact of control methods), and Simmons and Cuff (IPM).

The book should be submitted for typesetting by June, and we are hoping for publication late in 1983.

CANUSA-West is planning a trio of management manuals to be printed in the first half of 1984. Martha Brookes will be providing editorial expertise on these texts, which are presently entitled *Western Spruce Budworm*, *Managing Trees and Stands Susceptible to Western Spruce Budworm*, and *Western Spruce Budworm and Forest Management Planning*.

In addition to these "big books," both U.S. components will be submitting for publication about 34 shorter handbooks to appear in USDA series. (The Grimble, Adamus, and Montgomery titles listed earlier are the first in this group.) At least 29 of these handbooks will be in print by summer 1984, available for use in the Program's technology transfer workshops and for inclusion in our "big bibliography."

Early in November CANUSA received permission from the Chief of the Forest Service to print a composite of the *Spruce Budworms Bibliography* and its supplements (about 4,000 citations in all) as a book in the USDA Bibliographies and Literature of Agriculture series. We expect to enter data for all of CANUSA's American and Canadian publications in our last pass through the data base, just before the Program terminates. The magic of the computer at Oak Ridge, mentioned previously, will enable us to collate all entries, renumber, and realphabetize them by senior author. And the final publication will be laid out from type set by the computer.

Two other Program-wide documents, now in the planning phase, deserve brief mention. The Washington Office will assemble the final *Program Accomplishments Report* for publication as a USDA Agriculture Information Bulletin. This handbook will have text describing the Program's achievements by target area and photographs illustrating both Canadian and American contributions to the Program. Janet Lalonde, of the Canadian Forestry Service technical editing staff in Ottawa, will assemble and edit papers to be presented at the Program's international symposium scheduled for September 1984. Because speakers are required to turn in reviewed copy of their talks at the start of the symposium, Janet is expecting to have the manuscripts edited and ready for typesetting by the end of calendar '84. The proceedings should be published by mid-1985.

To get more information or to have your name added to the mailing list for the *Newsletter*, contact

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